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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/621,585	07/17/2003	Jae-Young Ahn	5649-1119	2601

20792 7590 11/14/2006

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EXAMINER	
LUND, JEFFRIE ROBERT	

ART UNIT	PAPER NUMBER
1763	

DATE MAILED: 11/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/621,585	AHN ET AL.	
	Examiner	Art Unit	
	Jeffrie R. Lund	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 August 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3-15 and 21-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-15 and 21-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cook et al, US Patent 6,352,594 B2, in view of Sandhu et al, US Patent 6,499,425 B1.

Cook et al teaches a CVD apparatus that includes: a processing chamber 42; a wafer boat 40 holding a plurality substrates 56; a showerhead 78 configured to spray the reaction gas parallel to the substrates, having a housing 80 with a first plenum 88 receiving a first gas via an inlet port 84, a second plenum 90 receiving a second gas via an inlet port 86, a spray plate 94, and a cooling channel. (Figure 7)

Cook et al differs from the present invention in that Cook et al does not teach a wire gas heater in the first plenum and connected to a terminal.

Sandhu et al teaches a CVD apparatus that includes: a processing chamber 201; a susceptor 204 for holding a substrate 206; and a shower head 210 comprising a housing 342, a spray plate 234, inlet ports 238, 240 and a wire heating element 222 in the housing between the inlet ports and the spray plate. The wire heats and partially ionizes the processing gases prior to entering the processing chamber. (Entire documents, specifically, Figures 9 and 10 and column 8 lines 42-67)

The motivation for adding the gas heater of Sandhu et al to the apparatus of

Cook et al is to heat and partially ionize the gas prior to its entry into the processing chamber as taught by Sandhu et al.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the gas heater of Sandhu et al to the apparatus of Cook et al.

3. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cook et al and Sandhu et al as applied to claims 3 and 7 above, and further in view of Yamanaka et al, US Patent 6,653,212 B1.

Cook et al and Sandhu et al differ from the present invention in that they do not teach that the wire heater is coiled heating wire made from tungsten.

Yamanaka et al teaches a coil wire heater 5 made of tungsten. (Figure 1, column 5 lines 12-21)

The motivation for replacing the generic wire heater of Cook et al and Sandhu et al with the heating wire of Yamanaka et al is to provide a specific heating wire as required by Cook et al and Sandhu et al but only generically described. A coiled wire heater is a more efficient because it provides more heating surface in the same amount of space.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the wire heater of Cook et al and Sandhu et al the tungsten coiled wire heater of Yamanaka et al.

4. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cook et al and Sandhu et al.

Cook et al and Sandhu et al differ from the present invention in that they do not teach that the terminal is elastic and insolates the terminal from the housing.

Ceramic (electrically insulating) spring load (elastic) terminals are well known in the and commonly use to mount wires for various purposes. Examples of these terminals can be seen in halogen lighting systems.

The motivation for adding a specific terminal means to the apparatus of Cook et al and Sandhu et al is to provide a means for mounting the wire heater as required by Cook et al and Sandhu et al but not described.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the terminal means of Cook et al and Sandhu et al electrically insulating and elastic.

5. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cook et al and Sandhu et al as applied to claims 3 and 7 above, and further in view of Arami et al, US Patent 5,958,140.

Cook et al and Sandhu et al differ from the present invention in that they do not teach that the sidewalls of the showerhead are cooled.

Arami et al teaches a showerhead with cooled sidewalls 47. (Figure 2)

The motivation for adding the cooling means of Arami et al to the apparatus of Cook et al and Sandhu et al is to maintain the showerhead at a specific temperature.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the cooling means of Arami et al to the apparatus of Cook et al and Sandhu et al.

6. Claims 12-15, 22, 24, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cook et al, Sandhu et al, and Arami et al as applied to claims 3, 7, 10, and 11 above, and further in view of Ohashi et al, US Patent 6,059,885.

Cook et al, Sandhu et al, and Arami et al differ from the present invention in that they do not teach that the first plenum extends further from the processing chamber than the second plenum.

Ohashi et al teaches a first plenum S extends further from the processing chamber than the second plenum 719'. (Figure 7)

The motivation for elongating the first plenum in the apparatus of Cook et al, Sandhu et al, and Arami et al is to provide a specific shape for the plenums as taught by Ohashi et al. Furthermore, it has been held that a change in shape is a matter of choice which a person of ordinary skill in the art would have found obvious. (See *In re Dailey*, 357 F.2d 669,149 USPQ 47 (CCPA 1966) MPEP 2144.04.IV.B)

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to elongate the first plenum of Cook et al, Sandhu et al, and Arami et al as taught by Ohashi et al.

7. Claims 3, 7, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brors et al, US Patent 6,352,593 B1, in view of Sandhu et al, US Patent 6,499,425 B1.

Brors et al teaches a CVD apparatus that includes: a processing chamber 22a; a susceptor 46 holding a plurality substrates 44; a showerhead 208 configured to spray the reaction gas parallel to the substrates, having a housing with a first plenum 231a

receiving a first gas via an inlet port 232, a second plenum 231b receiving a second gas via an inlet port 232, a common co-planar spray plate 234, and a cooling channel 235 to cool the housing. (Figures 31a, 32a, 33a, 36)

Brors et al differs from the present invention in that Brors et al does not teach a wire gas heater in the first plenum and connected to a terminal.

Sandhu et al teaches a CVD apparatus that includes: a processing chamber 201; a susceptor 204 for holding a substrate 206; and a shower head 210 comprising a housing 342, a spray plate 234, inlet ports 238, 240 and a wire heating element 222 in the housing between the inlet ports and the spray plate. The wire heats and partially ionizes the processing gases prior to entering the processing chamber. (Entire documents, specifically, Figures 9 and 10 and column 8 lines 42-67)

The motivation for adding the gas heater of Sandhu et al to the apparatus of Brors et al is to heat and partially ionize the gas prior to its entry into the processing chamber as taught by Sandhu et al.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the gas heater of Sandhu et al to the apparatus of Brors et al.

8. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brors et al and Sandhu et al as applied to claims 3, 7, 10, and 11 above, and further in view of Yamanaka et al, US Patent 6,653,212 B1.

Brors et al and Sandhu et al differ from the present invention in that they do not teach that the heating wire is a coiled heating wire is made from tungsten.

Yamanaka et al teaches a coil wire heater 5 made of tungsten. (Figure 1, column 5 lines 12-21)

The motivation for replacing the generic wire heater of Brors et al and Sandhu et al with the heating wire of Yamanaka et al is to provide a specific heating wire as required by Brors et al and Sandhu et al but only generically described. A coiled wire heater is a more efficient because it provides more heating surface in the same amount of space.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the wire heater of Brors et al and Sandhu et al the tungsten coiled wire heater of Yamanaka et al.

9. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brors et al and Sandhu et al.

Brors et al and Sandhu et al differ from the present invention in that they do not teach that the terminal is elastic and insolates the terminal from the housing.

Ceramic (electrically insulating) spring loaded (elastic) terminals are well known in the and commonly use to mount wires for various purposes. Examples of these terminals can be seen in halogen lighting systems.

The motivation for adding a specific terminal means to the apparatus of Brors et al and Sandhu et al is to provide a means for mounting the wire heater as required by Brors et al and Sandhu et al but not described.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the terminal means of Brors et al and Sandhu et al

electrically insulating and elastic.

10. Claims 12-15, and 21-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brors et al, and Sandhu et al as applied to claims 3, 7, 10, and 11 above, and further in view of Ohashi et al, US Patent 6,059,885.

Brors et al, and Sandhu et al differ from the present invention in that they do not teach that the first plenum extends further from the processing chamber than the second plenum.

Ohashi et al teaches a first plenum S extends further from the processing chamber than the second plenum 719'.

The motivation for elongating the first plenum in the apparatus of Brors et al, and Sandhu et al is to provide a specific shape for the plenums as taught by Ohashi et al. Furthermore, it has been held that a change in shape is a matter of choice which a person of ordinary skill in the art would have found obvious. (See *In re Dailey*, 357 F.2d 669,149 USPQ 47 (CCPA 1966) MPEP 2144.04.IV.B)

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to elongate the first plenum of Brors et al, Sandhu et al, and Arami et al as taught by Ohashi et al.

11. Claims 3, 7, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garnache, US Patent 3,603,284 in view of Sandhu et al, US Patent 6,499,425 B1.

Garnache teaches a CVD apparatus that includes: a processing chamber 18; a susceptor 28 holding a plurality substrates 30; a showerhead configured to spray the

reaction gas parallel to the substrates, having a housing 14 with a plenum 36 receiving a first gas 32 via an inlet port 34, a spray plate 40, and a cooling channel to cool the housing. (Figure)

Garnache differs from the present invention in that Garnache does not teach a wire gas heater in the first plenum and connected to a terminal.

Sandhu et al teaches a CVD apparatus that includes: a processing chamber 201; a susceptor 204 for holding a substrate 206; and a shower head 210 comprising a housing 342, a spray plate 234, inlet ports 238, 240 and a wire heating element 222 in the housing between the inlet ports and the spray plate. The wire heats and partially ionizes the processing gases prior to entering the processing chamber. (Entire documents, specifically, Figures 9 and 10 and column 8 lines 42-67)

The motivation for adding the gas heater of Sandhu et al to the apparatus of Garnache is to heat and partially ionize the gas prior to its entry into the processing chamber as taught by Sandhu et al.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the gas heater of Sandhu et al to the apparatus of Garnache.

12. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garnache and Sandhu et al as applied to claims 3, 7, 10, and 11 above, and further in view of Yamanaka et al, US Patent 6,653,212 B1.

Garnache and Sandhu et al differ from the present invention in that they do not teach that the heating wire is a coiled heating wire is made from tungsten.

Yamanaka et al teaches a coil wire heater 5 made of tungsten. (Figure 1, column 5 lines 12-21)

The motivation for replacing the generic wire heater of Garnache and Sandhu et al with the heating wire of Yamanaka et al is to provide a specific heating wire as required by Garnache and Sandhu et al but only generically described. A coiled wire heater is a more efficient because it provides more heating surface in the same amount of space.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the wire heater of Garnache and Sandhu et al the tungsten coiled wire heater of Yamanaka et al.

13. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garnache and Sandhu et al.

Garnache and Sandhu et al differ from the present invention in that they do not teach that the terminal is elastic and insolates the terminal from the housing.

Ceramic (electrically insulating) spring loaded (elastic) terminals are well known in the and commonly use to mount wires for various purposes. Examples of these terminals can be seen in halogen lighting systems.

The motivation for adding a specific terminal means to the apparatus of Garnache and Sandhu et al is to provide a means for mounting the wire heater as required by Garnache and Sandhu et al but not described.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the terminal means of Garnache and Sandhu et al

electrically insulating and elastic.

14. Claims 3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foehring et al, US Patent 3,805,736, in view of Sandhu et al, US Patent 6,499,425 B1.

Foehring et al teaches a CVD apparatus that includes: a processing chamber; a susceptor 32 holding a plurality substrates; a showerhead configured to spray the reaction gas parallel to the substrates, having a housing 76, 78, 80 with a first plenum receiving a first gas via an inlet port 38, a second plenum receiving a second gas via an inlet port 52, and a common co-planar spray plate 54. (Figures 2, 3, 5, and 7)

Foehring et al differs from the present invention in that Foehring et al does not teach a wire gas heater in the first plenum and connected to a terminal.

Sandhu et al teaches a CVD apparatus that includes: a processing chamber 201; a susceptor 204 for holding a substrate 206; and a shower head 210 comprising a housing 342, a spray plate 234, inlet ports 238, 240 and a wire heating element 222 in the housing between the inlet ports and the spray plate. The wire heats and partially ionizes the processing gases prior to entering the processing chamber. (Entire documents, specifically, Figures 9 and 10 and column 8 lines 42-67)

The motivation for adding the gas heater of Sandhu et al to the apparatus of Foehring et al is to heat and partially ionize the gas prior to its entry into the processing chamber as taught by Sandhu et al.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the gas heater of Sandhu et al to the apparatus of Foehring et al.

15. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foehring et al and Sandhu et al as applied to claims 3 and 7 above, and further in view of Yamanaka et al, US Patent 6,653,212 B1.

Foehring et al and Sandhu et al differ from the present invention in that they do not teach that the heating wire is a coiled heating wire is made from tungsten.

Yamanaka et al teaches a coil wire heater 5 made of tungsten. (Figure 1, column 5 lines 12-21)

The motivation for replacing the generic wire heater of Foehring et al and Sandhu et al with the heating wire of Yamanaka et al is to provide a specific heating wire as required by Foehring et al and Sandhu et al but only generically described. A coiled wire heater is a more efficient because it provides more heating surface in the same amount of space.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the wire heater of Foehring et al and Sandhu et al the tungsten coiled wire heater of Yamanaka et al.

16. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foehring et al and Sandhu et al.

Foehring et al and Sandhu et al differ from the present invention in that they do not teach that the terminal is elastic and insolates the terminal from the housing.

Ceramic (electrically insulating) spring loaded (elastic) terminals are well known in the and commonly use to mount wires for various purposes. Examples of these terminals can be seen in halogen lighting systems.

The motivation for adding a specific terminal means to the apparatus of Foehring et al and Sandhu et al is to provide a means for mounting the wire heater as required by Foehring et al and Sandhu et al but not described.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the terminal means of Foehring et al and Sandhu et al electrically insulating and elastic.

17. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foehring et al and Sandhu et al as applied to claims 3 and 7 above, and further in view of Arami et al, US Patent 5,958,140.

Foehring et al and Sandhu et al differ from the present invention in that they do not teach that the sidewalls of the showerhead are cooled.

Arami et al teaches a showerhead with cooled sidewalls 47. (Figure 2)

The motivation for adding the cooling means of Arami et al to the apparatus of Foehring et al and Sandhu et al is to maintain the showerhead at a specific temperature.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the cooling means of Arami et al to the apparatus of Foehring et al and Sandhu et al.

18. Claims 12-15, and 21-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foehring et al, Sandhu et al, and Arami et al as applied to claims 3, 7, 10, and 11 above, and further in view of Ohashi et al, US Patent 6,059,885.

Foehring et al, Sandhu et al, and Arami et al differ from the present invention in

that they do not teach that the first plenum extends further from the processing chamber than the second plenum.

Ohashi et al teaches a first plenum S extends further from the processing chamber than the second plenum 719'. (Figure 7)

The motivation for elongating the first plenum in the apparatus of Foehring et al, Sandhu et al, and Arami et al is to provide a specific shape for the plenums as taught by Ohashi et al. Furthermore, it has been held that a change in shape is a matter of choice which a person of ordinary skill in the art would have found obvious. (See *In re Dailey*, 357 F.2d 669,149 USPQ 47 (CCPA 1966) MPEP 2144.04.IV.B)

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to elongate the first plenum of Foehring et al, Sandhu et al, and Arami et al as taught by Ohashi et al.

Response to Arguments

19. Applicant's arguments with respect to claims 3-15, and 21-27 have been considered but are moot in view of the new ground(s) of rejection.

20. Applicant's arguments filed March 9, 2006 have been fully considered but they are not persuasive.

a. The 102 rejections under Sandhu et al (paragraph 3) is a typographical error and should have been deleted in the previous office action. It has been deleted in the present action.

b. In regard to the argument that:

> The Applicants respectfully submit that there is no motivation to modify the apparatus of Cook to include the gas heater of Sandhu, and that Cook actually teaches away from such a modification. As discussed in portions of Cook cited in the Final Office

> Action:
>
> FIG. 7 illustrates a gas injector 78 having a body 80 .... Two gas fittings 84, 86 are shown, providing input for reactant gas to gas channels 88, 90. A water channel 92 is shown between the channels 88, 90 for passage of water to cool the injector 78. (Underline added.)
>
> Cook, col. 4, lines 63-65. Cook teaches away from inclusion of heating element 222 coupled to a gas conduit from Sandhu because Cook discusses "passage of water to cool the injector 78."
>
> The Office Action further states that " The motivation for adding the gas heater of Sandhu et al to the apparatus of Cook et al is to heat and partially ionize the gas prior to its entry into the processing chamber as taught by Sandhu et al." The Applicants respectfully submit that the Office Action is improperly combining two references to modify the primary Cook reference to provide the opposite of its stated functionality (i. e., cooling the injector 78). Accordingly, the Applicants submit that there is no motivation to combine Cook and Sandhu as suggested by the Office Action, and that in fact, Cook teaches away from such a combination.

The Examiner disagrees. The Applicants argue that the "stated functionality" of Cook et al is "cooling the injector 78", and that adding the gas heater of Sandhu et al is improper. Sandhu et al teaches heating the gas in conduit 238 (Figure 9) or 228 (Figure 10). Sandhu et al does not require heating the entire gas injector. Cook et al only teaches a water channel to cool the injector. Cook et al provides no teaching or suggestion that the injector or gas cannot be heated, or that the gas is cooled. Thus, neither Sandhu et al nor Cook et al provide any support for Applicant's argument. Furthermore, it is well known in the art to both heat the gas and cool the gas injector. It is common to heat the gas prior to its entry into the chamber to prevent it from condensing and to raise the temperature of the gas to near the dissociation temperature, and to cool the injector. This is done to maintain the temperature of the gas in the proper temperature range. If a gas is too cool it can condense or cause thermal shock to the substrate, and if the gas is too hot it can dissociate and deposit on the injector causing damage to the injector. (See US Patent Application 2003/0101938 A1 to Ronsse et al or US

Patent Application 2001/0035127 A1 to Metzner et al.) The injector of Cook et al is cooled to prevent the premature deposition, and thus does not prevent the gas from being heated.

c. In regard to the argument:

> Moreover, it would not be obvious to somehow selectively substitute elements of the Sandhu processing apparatus (where the wafer 206 is maintained perpendicular to a direction of gas flow) for elements of the Cook deposition apparatus (where the wafer is maintained parallel to a direction of gas flow).

The Examiner disagrees. The combination of Cook et al and Sandhu et al is directed to the internal structure of the showerhead, and has nothing to do with the external arrangement of the showerhead. The addition of the heater of Sandhu et al to the apparatus of Cook et al will not effect the orientation of the showerhead of Cook et al. One of ordinary skill in the art looking for a showerhead with a heater for heating a gas prior to introducing the gas into the processing chamber would consider all showerhead with heaters, not just those showerheads with the same orientation.

d. In regard to the argument:

> The Applicants respectfully submit that there is no motivation to modify the apparatus of Brors to include the gas heater of Sandhu, and that Brors actually teaches away from such a modification. As discussed in Brors:
>
> > The flow pattern of the process gases is vital to the formation of uniform layers upon wafers 44 .... Referring now to FIG. 30, process gases to be used in depositing layers on wafers 44 are provided via ducts 202 to a mixing chamber 204 which, along with a plurality of gas flow control devices 206 and a water-cooled injection plate 210, is included within gas injection manifold 200. (Underline added.)
>
> Brors, col. 15, lines 45-54. See also, Brors, col. 16 lines 28-29 and 57-58. Brors thus teaches away from inclusion of heating element 222 coupled to a gas conduit from Sandhu because Brors discusses "a water-cooled injection plate ... included within gas injection manifold" in a system where the "flow pattern of the process gases is vital .... "
>
> The Office Action further states that "The motivation for adding the gas heater of Sandhu et al to the apparatus of Brors et al is to heat and partially ionize the gas prior to its entry into the processing chamber as taught by Sandhu et al." The Applicants respectfully submit that the Office Action is improperly combining two references to

> modify the primary Brors reference to provide the opposite of its stated functionality (i. e., cooling the injection plate). Accordingly, the Applicants submit that there is no motivation to combine Brors and Sandhu as suggested by the Office Action, and that in fact, Brors teaches away from such a combination.

The Examiner disagrees. First, the Applicants have misquoted Brors et al to make it seem that the water-cooled injector plate is vital to the gas flow pattern. Brors et al actually states "The flow pattern of the process gases is vital to the formation of uniform layers upon wafers 44 to be processed in reactor 20, especially for those CVD processes dominated by mass transport limited reactions." This is a general teaching about gas delivery in a CVD reactor. Nowhere does Brors et al state that cooled injection plate is vital to forming the flow pattern. The Examiner notes that Sandhu et al is also directed to a CVD reactor. Second, the Applicants argue that the "stated functionality" of Brors et al is "cooling the injector plate", and that adding the gas heater of Sandhu et al is improper. Sandhu et al teaches heating the gas in conduit 238 (Figure 9) or 228 (Figure 10). Sandhu et al does not require heating the entire gas injector. Brors et al only teaches a water channel to cool the injector plate. Brors et al provides no teaching or suggestion that the injector or gas cannot be heated, or that the gas is cooled. Thus, neither Sandhu et al nor Brors et al provide any support for Applicant's argument. Furthermore, it is well known in the art to both heat the gas and cool the gas injector, as was discussed above.

e. In regard to the argument:

> Moreover, it would not be obvious to somehow selectively substitute elements of the Sandhu processing apparatus (where the wafer 206 is maintained perpendicular to a direction of gas flow) for elements of the Brors process chamber (where the wafer is maintained parallel to a direction of gas flow).

The Examiner disagrees. The combination of Brors et al and Sandhu et al is directed to the internal structure of the showerhead, and has nothing to do with the external arrangement of the showerhead. The addition of the heater of Sandhu et al to the apparatus of Brors et al will not effect the orientation of the showerhead of Brors et al. One of ordinary skill in the art looking for a showerhead with a heater for heating a gas prior to introducing the gas into the processing chamber would consider all showerhead with heaters, not just those showerheads with the same orientation.

f. In regard to the argument:

> The Applicants respectfully submit that there is no motivation to modify the apparatus of Garnache to include the gas heater of Sandhu, and that Garnache actually teaches away from such a modification. As discussed in Garnache:
>
> > Also shown in a heat shield 40 which may be mounted on the reaction chamber side of gas distribution baffle 38. The purpose of heat shield 40 is to reflect energy radiated from ... the heated susceptor 28 which may prove harmful to baffle 38 .... The plate is constructed such that it ... will effectively prevent the baffle 38 from overheating and perhaps out-gassing or decomposing. (Underline added.)
>
> Garnache, col. 3, lines 28-39. Garnache thus teaches away from inclusion of heating element 222 coupled to a gas conduit from Sandhu because Garnache discusses a heat shield to "prevent the baffle from overheating."
>
> The Office Action further states that "The motivation for adding the gas heater of Sandhu et al to the apparatus of Garnache is to heat and partially ionize the gas prior to its entry into the processing chamber as taught by Sandhu et al." The Applicants respectfully submit that the Office Action is improperly combining two references to modify the primary Garnache reference to provide the opposite of its stated functionality (i. e., reflecting heat away from the baffle so that the baffle does not overheat). Accordingly, the Applicants submit that there is no motivation to combine Garnache and Sandhu as suggested by the Office Action, and that in fact, Garnache teaches away from such a combination.

The Examiner disagrees. The Applicants have argued that the heat shield of Garnache teaches away from adding a heater to heat the gases prior to entry into the processing chamber. The heat shield is located outside of the

showerhead and protects the showerhead from heat radiated by the susceptor. The heat shield is not part of the showerhead, and only suggests that the baffle plate should not be overheated (i.e. the baffle can be heater bust should not be overheated) by the susceptor. Garnache does not teach or suggest that the baffle plate should not be heated, and is silent on not heating the process gas.

g. In regard to the argument:

> Moreover, it would not be obvious to somehow selectively substitute elements of the Sandhu processing apparatus (where the wafer 206 is maintained in a horizontal orientation) for elements of the Garnache vapor deposition apparatus (where the substrates 30 are maintained in a vertical orientation).

The Examiner disagrees. The combination of Garnache and Sandhu et al is directed to the internal structure of the showerhead, and has nothing to do with the external arrangement of the showerhead. The addition of the heater of Sandhu et al to the apparatus of Garnache will not effect the orientation of the showerhead of Garnache. One of ordinary skill in the art looking for a showerhead with a heater for heating a gas prior to introducing the gas into the processing chamber would consider all showerhead with heaters, not just those showerheads with the same orientation.

h. In regard to the argument:

> The Applicants respectfully submit that there is no motivation to modify the apparatus of Foehring to selectively substitute elements of Sandhu into Foehring. As shown in Figures 2 and 3 of Foehring, reactant gas flow is parallel to the surface of the substrate 36, while the reactant gas flow of Sandhu is perpendicular to the surface of wafer 206. As discussed in Foehring:
>
> > Because the reactant gases are passed over the substrate surfaces in laminar flow it is possible to maintain a substantially uniform, and controllable, deposition rate .... Because turbulent flow is not used, no unpredictable irregularities in the flow pattern can cause irregular deposition rates at different parts of a substrate surface.
>
> Foehring, col. 5, line 62 to col. 6, line 2. Accordingly, it would not be obvious to selectively substitute elements of the apparatus of Sandhu providing perpendicular reactive gas flow

into the apparatus of Foehring providing parallel reactive gas flow.

The Examiner disagrees. The combination of Foehring et al and Sandhu et al is directed to the internal structure of the showerhead, and has nothing to do with the external arrangement of the showerhead. The addition of the heater of Sandhu et al to the apparatus of Foehring et al will not effect the orientation of the showerhead of Foehring et al. One of ordinary skill in the art looking for a showerhead with a heater for heating a gas prior to introducing the gas into the processing chamber would consider all showerhead with heaters, not just those showerheads with the same orientation.

i. In regard to the arguments directed to claims 12 and 14, the Examiner disagrees. The arguments directed to claims 12 and 14 are the same as the arguments directed to claim 3. The Examiner disagrees with the arguments for the reasons discussed above.

j. In regard to the argument that "the relative lengths of the plenums is significant", the Examiner disagrees. The variable length of the plenums in the showerhead is not significant in that the length of the plenum in the showerhead is varied as a possible alternate embodiment. The Applicants disclose showerheads having the same size plenums (Figures 6-10), and showerheads with variable length plenums (Figures 11 and 12). No significant difference is noted by the Applicants.

k. In regard to the argument that Ronsse et al is not prior art, the Examiner disagrees. Ronsse et al is a continuation-in-part of application 09/179,921, filed

October 27, 1998, now US Patent 6,454,860 B2 to Metzner et al. Thus, Ronsse et al has a filing date of October 27, 1998 and is art.

l. Metzner et al (20010035127) and Ronsse et al (2003/010938) were provided to teach that it is known in the art to heat a gas and cool an injector. The Examiner still maintains Official Notice that it is known in the art to both heat a gas and cool an injector. The Official Notice is used only to show that combinations of Cook et al or Brors et al in view of Sandhu et al (i.e. a gas heater with a cooled injector) were known in the art and thus "in the knowledge generally available to one of ordinary skill in the art" and to show that one of ordinary skill in the art would have reasonable expectation for success as required by MPEP 2143. The references have not been included in the rejection because they are only directed to general knowledge in the art and to counter arguments made by the Applicants.

21. The Examiner noted while reviewing Sandhu et al, that the heaters 222 shown in figure 9 of Sandhu et al have a different orientation than do the heaters taught in the current invention. In the present invention, the gas flows across the coiled element, while in Sandhu et al the gas flows through the coiled heater (along the longitudinal axis of the coil). If the claims were amended to recite this difference, they would overcome the rejections based on Sandhu et al. Applicants should also consider Ryoji et al (6,211,622 and 5,942845) to ensure that they also overcome the possible rejections based on Ryoji et al. Such an amendment would require further search and consideration, and should be filed as part of an RCE.

Conclusion

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited art teaches:

a. Ronsse et al and Metzner et al teaches gas heaters for heating processing gases prior to injection into the processing chamber through a cooled gas injector.

b. Ryoji et al could be used to in place of Sandhu et al in the rejections above.

These rejections have not been made because they do not provide any additional or different teachings, and if they were applied, would have resulted in an undue multiplication of references. (See MPEP 707.07(g))

23. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

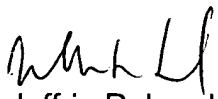
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

24. Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Jeffrie R. Lund whose telephone number is (571) 272-1437. The examiner can normally be reached on Monday-Thursday (6:30 am-6:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jeffrie R. Lund
Primary Examiner
Art Unit 1763

JRL
11/11/06